and at Sara Sota (one hundred and twenty-five miles south of this place) a snow storm raged for four hours.

Key West, Florida: the lowest temperature since the establishment of this station occurred on the 12th; a temperature of 19° was recorded at Tampa, where ice formed to the thickness of an inch on shallow water; throughout southern Florida the thermometer fell below freezing, and the injury done to the fruit interest is incalculable.

Mr. Charles C. Livermore, Fort Gatlin, Orange county, Florida, reports that at 6 a. m. of the 12th the temperature was 19°.5; at 6 p. m. sleet began, and at 8 p. m. it turned into snow. This was the first instance on record of snow falling at this place.

Atlanta, Georgia: the thermometer fell to 2°.4 below zero on the 11th, which is the lowest on record; the ground was frozen to the depth of eighteen inches; twelve inches has always been considered below the freezing line by builders.

Augusta, Georgia: the temperature fell to 6°.0 on the morning of the 12th, which is the lowest in the record of the Signal Service, and, from information from trustworthy sources, the coldest weather experienced since 1835.

Savannah, Georgia: on the morning of the 12th the minimum thermometer recorded 12°, being the lowest ever recorded at this place; Ogeechee Canal froze, and people crossed on the ice; this has never occurred before; gas-metres and water-pipes froze, and great damage was done to crops.

Milledgeville, Baldwin county, Georgia: a more protracted cold spell is not remembered here; oats and all growing crops, except onions and spinach, were generally killed; on the 12th the river froze over, which is an unusual occurrence.

Athens, Clarke county, Georgia: the cold spell from the 9th to the 15th was the severest in the past ten years; the temperature is known to have been lower, but the duration and the accompanying strong wind made it unusually severe. The Oconee River froze on the 13th, which is an extremely rare occurrence.

Mr. C. B. La Hatte, Gainesville, Hall county, Georgia, furnishes the following: "The cold spell from the 8th to the 16th was the severest ever experienced in this region. During the night of the 8th four inches of snow fell, and on the morning of the 9th the temperature was 0°, the average for that day being 3°.3. On the 10th it was 2°.0 below zero, and on the morning of the 11th 7°.0 below zero, which was the minimum recorded during the cold spell; at noon the temperature was zero, the average for the day being 1°.3. * * * * Much suffering was caused among the poorer classes and to cattle; some trees were killed, and all tender shrubbery seriously injured if not killed. The ground froze to the depth of eighteen to twenty inches in exposed places, and small running streams froze over."

Charleston, South Carolina: the minimum thermometer recorded 10°.5 on the morning of the 11th, which is the lowest since the establishment of this station; ice three inches thick formed on ponds; all the early vegetables were killed, and several persons froze to death in this vicinity.

New River Inlet, North Carolina: the average minimum temperature for the 10th, 11th, 12th, and 13th was 9°.4, which, from all information obtainable, was the coldest weather ever known in this vicinity. The ice in New River is from six to eight inches thick, causing the suspension of navigation, which has not occurred before since 1835.

Mr. T. C. Harris, of the Department of Agriculture, Raleigh, North Carolina, reports as follows: "The cold spell from the 9th to the 13th was remarkable for this place, the thermometer falling to 5° on the mornings of the 11th and 12th; ice from three to seven inches thick formed on ponds. In western North Carolina the cold was much more intense, being as low as —12° in some places."

Mr. W. G. Simmons, voluntary observer at Wake Forest College, Wake county, North Carolina, reports that on the morning of the 8th there was a light fall of snow; on the morning of the 9th the minimum thermometer recorded 17°.5, from which time it gradually fell until the morning of the 12th, when it recorded 2°.0; the weather was clear throughout the cold spell.

Mr. Howard Shriver, voluntary observer at Wytheville, Wythe county, Virginia, reports as follows in reference to the cold spell in January: "All records revert to 1835 as the last date at which such a cold wave occurred. The temperature for a week was but a little above or a little below zero, the minimum at this place being 8° below zero on the morning of the 11th; reports from neighboring towns give 13°, 18° and 20° below zero; all these reports come from a belt lying to the south or southeast of my station, and the same phenomenon has occurred several times before, indicating the presence of a colder belt there than at this place; during this storm the wind was the most violent ever experienced; six inches of snow fell, and the drifts were eight to twelve feet deep."

Strafford, Strafford county, New Hampshire: the 12th was the coldest day for the past twenty-seven years.

II.—This area appeared north of Montana at 10 p. m. of the 13th, when the preceding one extended over the Atlantic coast districts, the high areas being separated by a well-defined low area which passed almost directly north from the Gulf States over the upper lake region. This high area remained in the region north of Dakota and Minnesota until the 22d, when it moved southward to northern Iowa and thence eastward over the Lake region and the Saint Lawrence Valley during the 23d, 24th, and 25th, when it disappeared over the north Atlantic.

III.—This area was at no time within the limits of the United States, but it was first observed on the 25th far to the north of Manitoba, and after moving slowly eastward during the 26th and 27th it apparently disappeared as a separate area without causing decided changes of temperature within the United States or Canada.

IV.—This area appeared north of Montana on the morning of the 28th and extended southward over the Rocky Mountain districts; the barometer, however, was not unusually high (ranging from 30.40 to 30.50) and no decided fall of temperature was observed. This area extended westward over the plateau regions during the following day, and on the 30th and 31st it extended eastward over the Missouri Valley, where it was central at the close of the month.

AREAS OF LOW PRESSURE.

Eleven areas of low pressure have been traced upon the tri-daily weather charts for January, while several barometric depressions appeared near the coast or along the northern boundary of the United States, which, although indicating the presence of low areas, were not sufficiently well defined to render it possible to locate on the chart the centre of depression. Six of these low areas apparently formed near the west Gulf coast; three resulted from low areas on the Pacific coast, and two were first observed north of Dakota.

The following table shows the latitude and longitude at which each area was first and last observed, and the average hourly velocity of each.

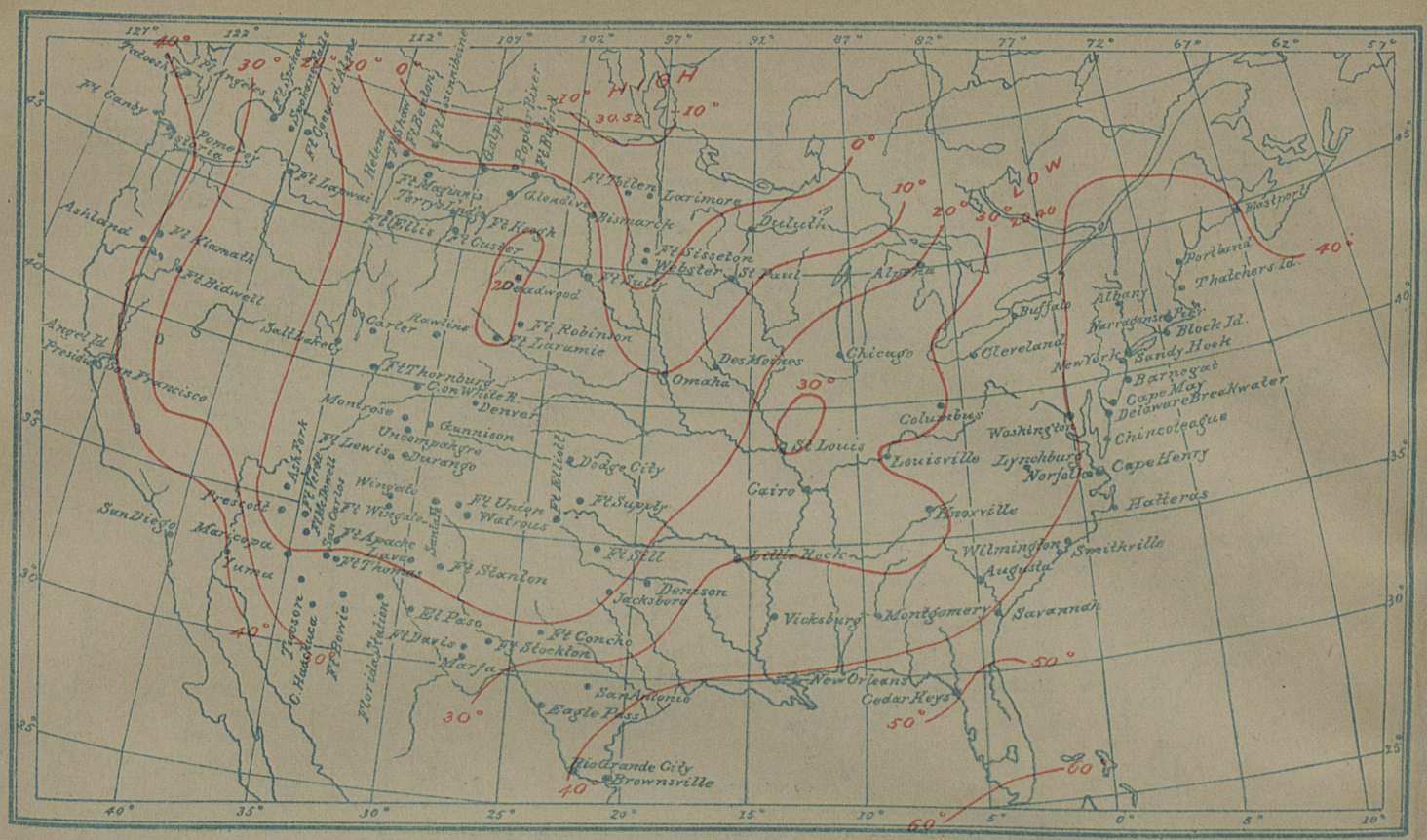
Low areas.	First observed.		Last observed.		Average velocity in miles per hour.
	Lat. N.	Long. W.	Lat. N.	Long. W.	
	° ′	° ′	° ′	° ′	
No. I	36 00	102 00	43 00	64 00	.....
II	29 00	98 00	47 00	63 00	20.0
III	27 00	98 00	51 00	66 00	34.0
IV	53 00	101 00	52 00	84 00	30 0
V	29 00	96 00	48 00	61 00	39.0
VI	37 00	92 00	49 00	61 00	52.0
VII	39 00	101 00	45 00	74 00	37.0
VIII	43 00	108 00	52 00	66 00	48 0
IX	29 00	97 00	37 00	85 00	23.0
X	50 00	124 00	53 00	101 00	47.0
XI	51 00	105 00	87 00	40 00	37.0

Mean hourly velocity, 36.7 miles.

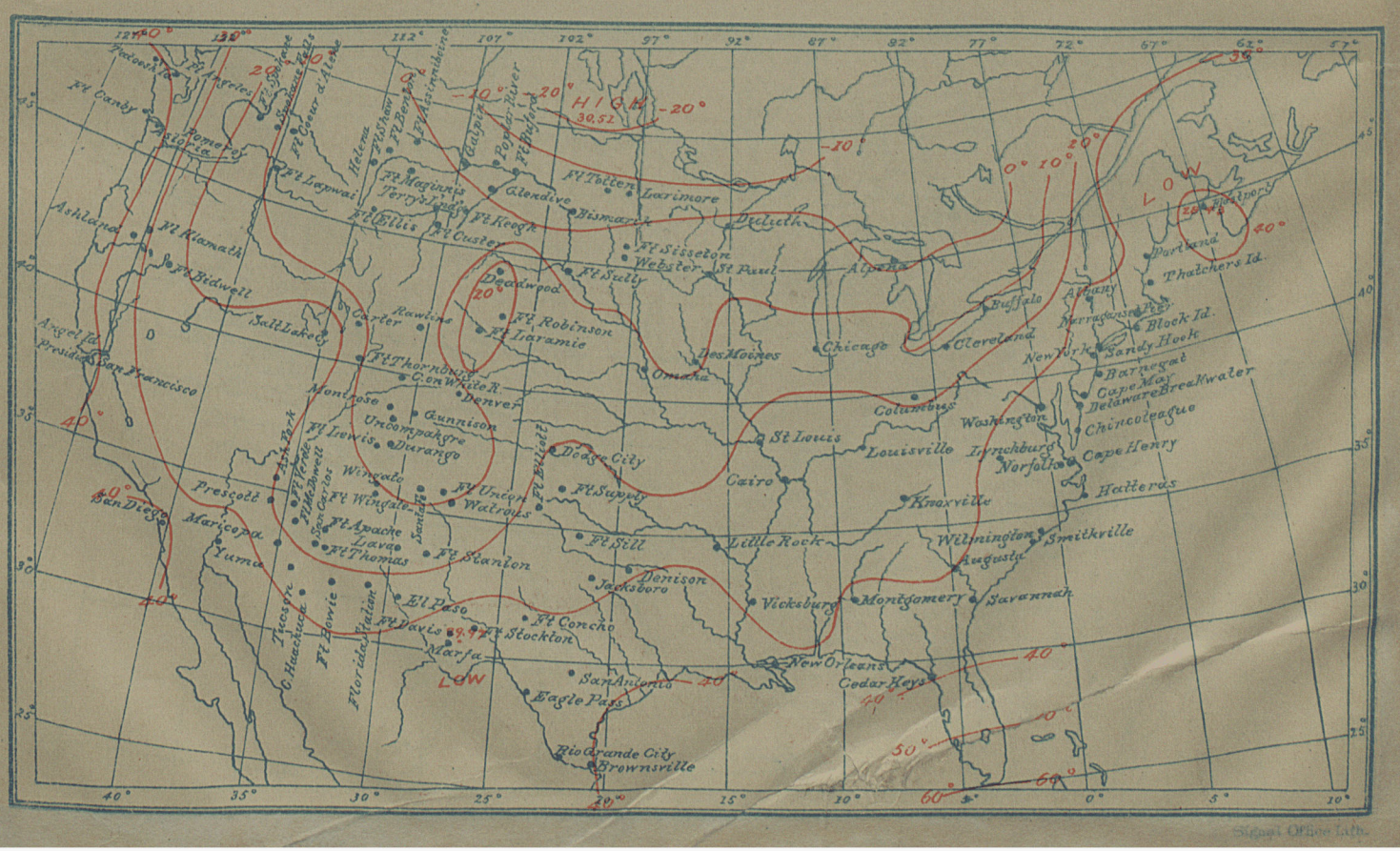
I.—This area has been previously described in the REVIEW for December, 1885, it having originated in the Southwest and moved along the Atlantic coast to New England, where it was central on the morning of the 1st. This storm developed considerable energy along the New England coast before disappearing to the eastward over the Atlantic.

II.—When the preceding storm was passing along the New England coast this area was forming in the extreme southwest, or the lower Rio Grande valley, the barometer being low from the west Gulf coast westward to southern California, and high areas of 30.30 extended over the middle Atlantic states, Dakota, and the north Pacific coast. During the 2d this storm moved slowly northward over the west Gulf states, forming a trough-shaped depression which extended to the upper lake region, while the high area in the eastern portion of the country moved in the same direction to the lower Saint Lawrence valley. The high area referred to as central over Dakota was apparently crowded to the westward and became a part of that on the Pacific coast, which increased in intensity and became more clearly defined as a high area over the central plateau region. On the 2d the area of precipitation included all districts of the central valleys and the Lake region; the winds were strong and from the north in the eastern Rocky Mountain districts, and there was a marked contrast of temperatures in these districts when compared with temperatures observed in the Mississippi Valley. At midnight of the 2d the temperature at Saint Louis, Missouri, was 57°, while at Dodge City, Kansas, on about the same latitude, it was 13°. This storm passed over the Mississippi Valley during the 2d and 3d, and was central near Milwaukee, Wisconsin, on the morning of the

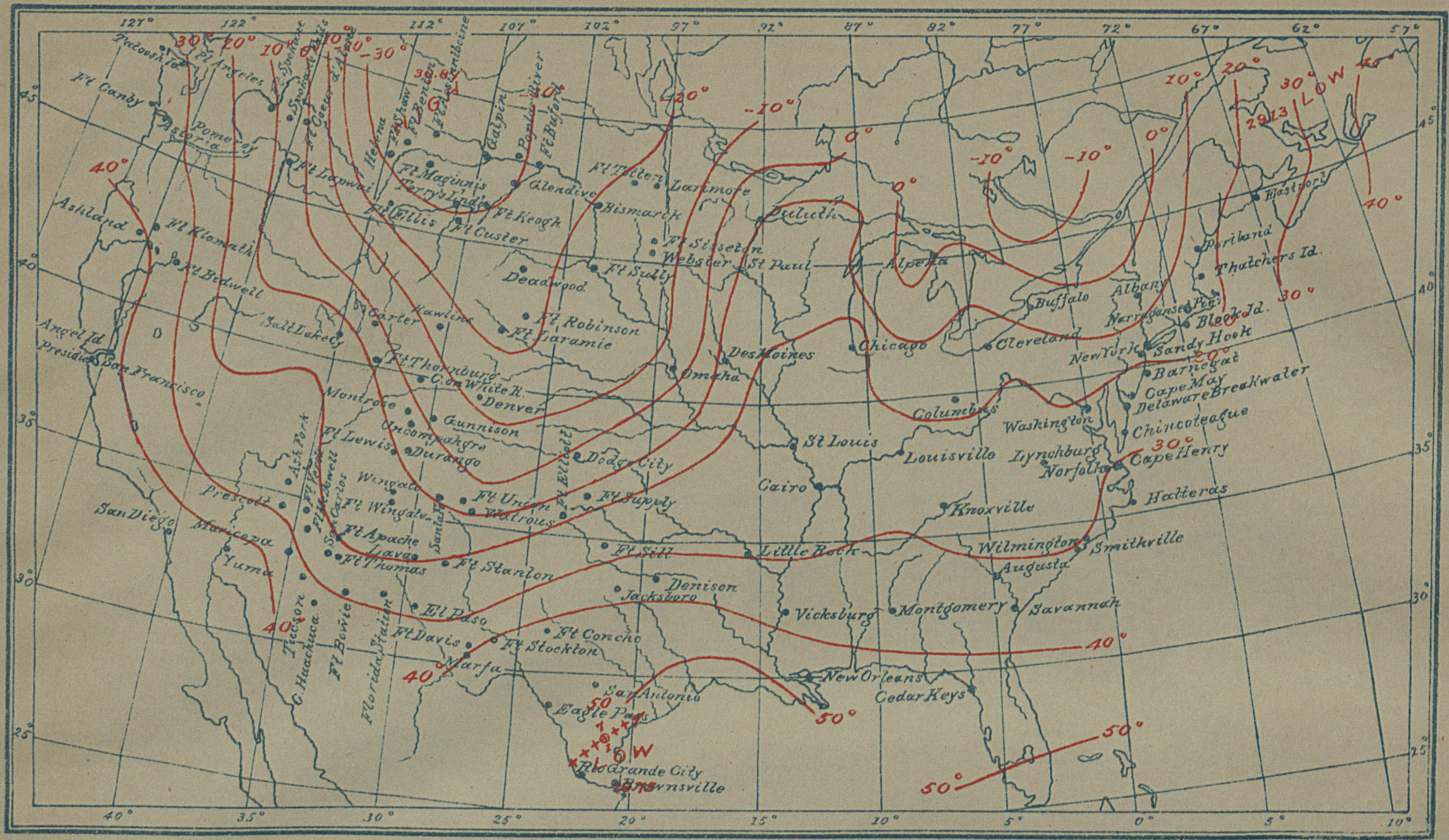
January 5, 1886—7 A. M.



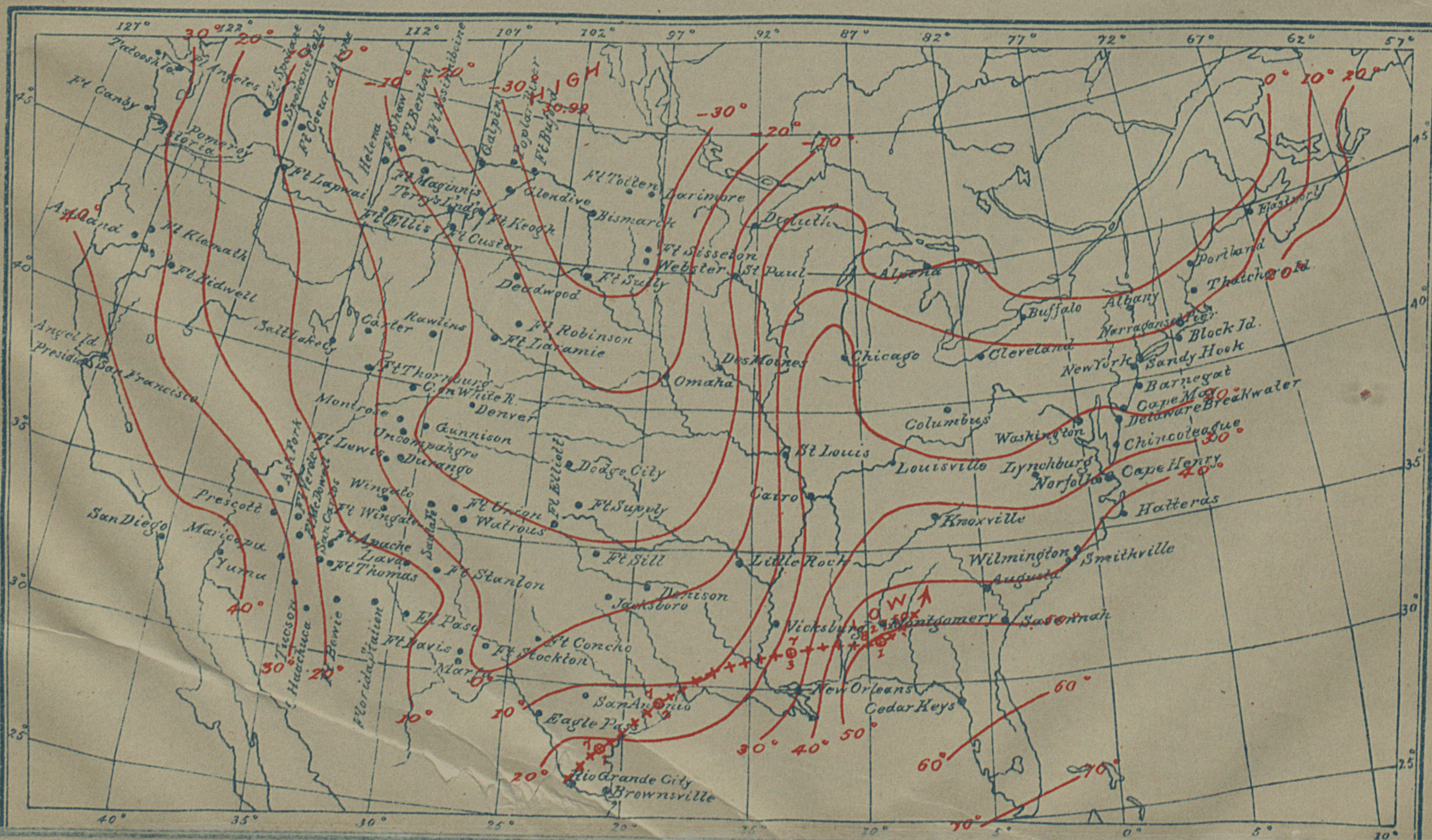
January 6, 1886—7 A. M.



January 7, 1886—7 A. M.

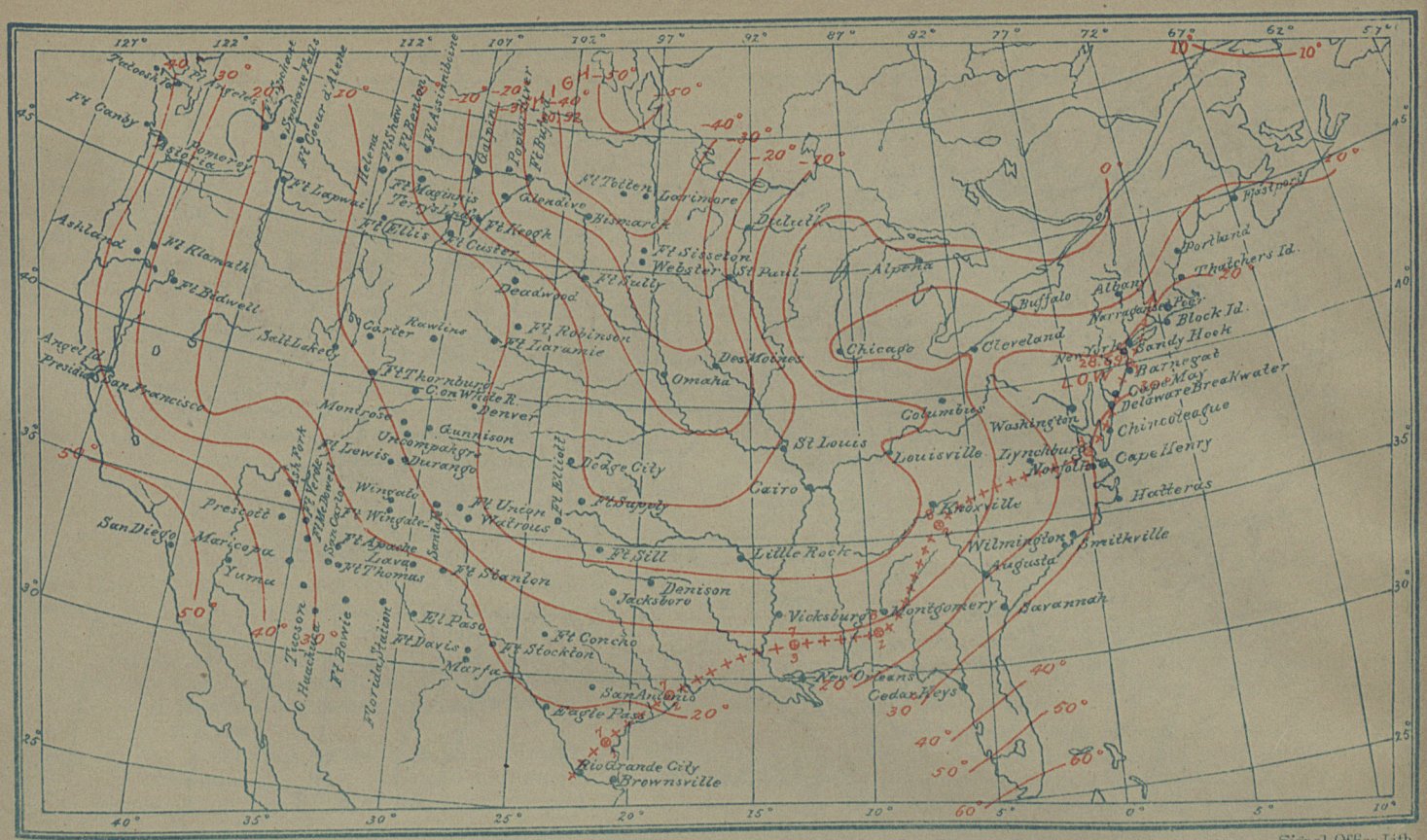


January 8, 1886—7 A. M.

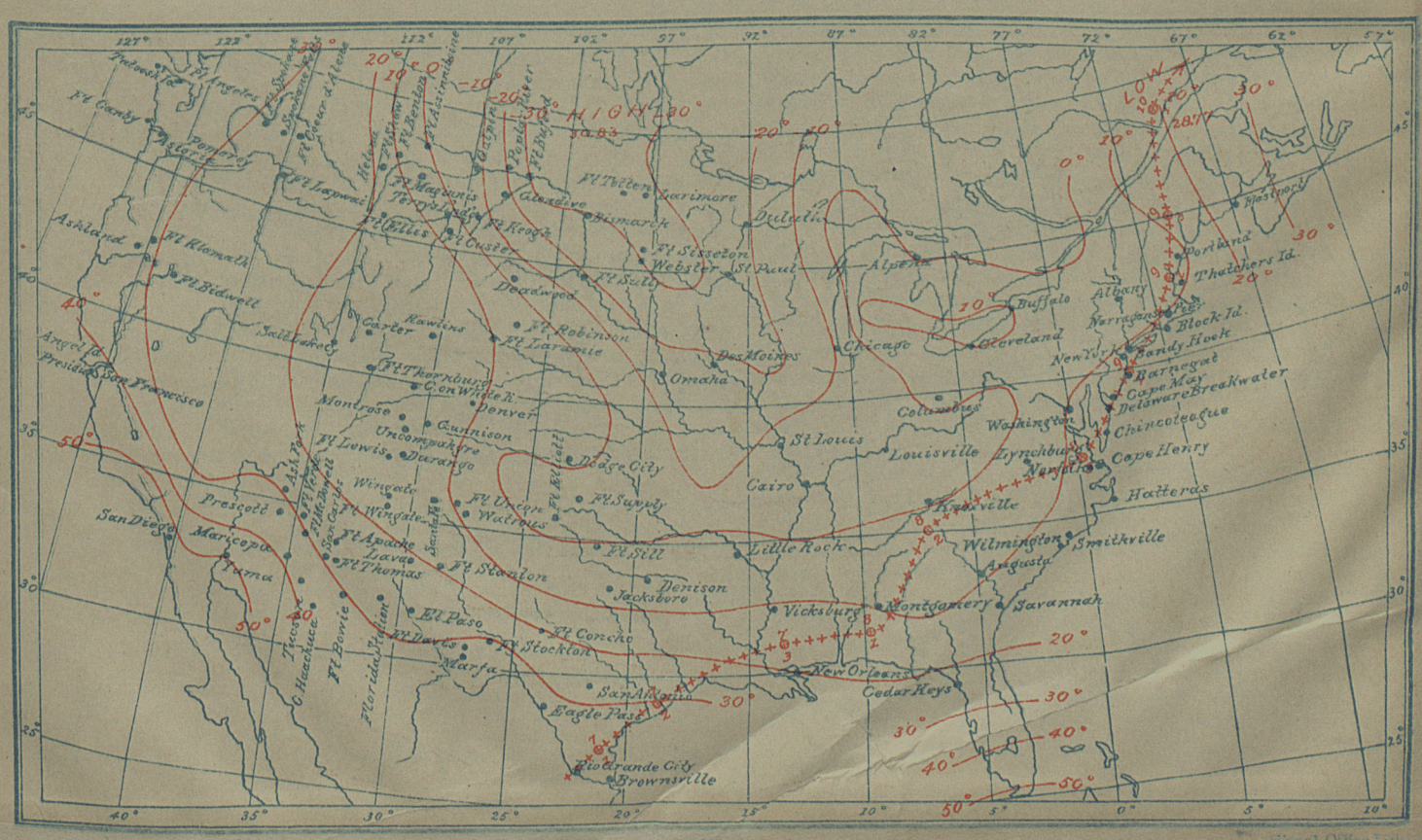


Signal Office Lith.

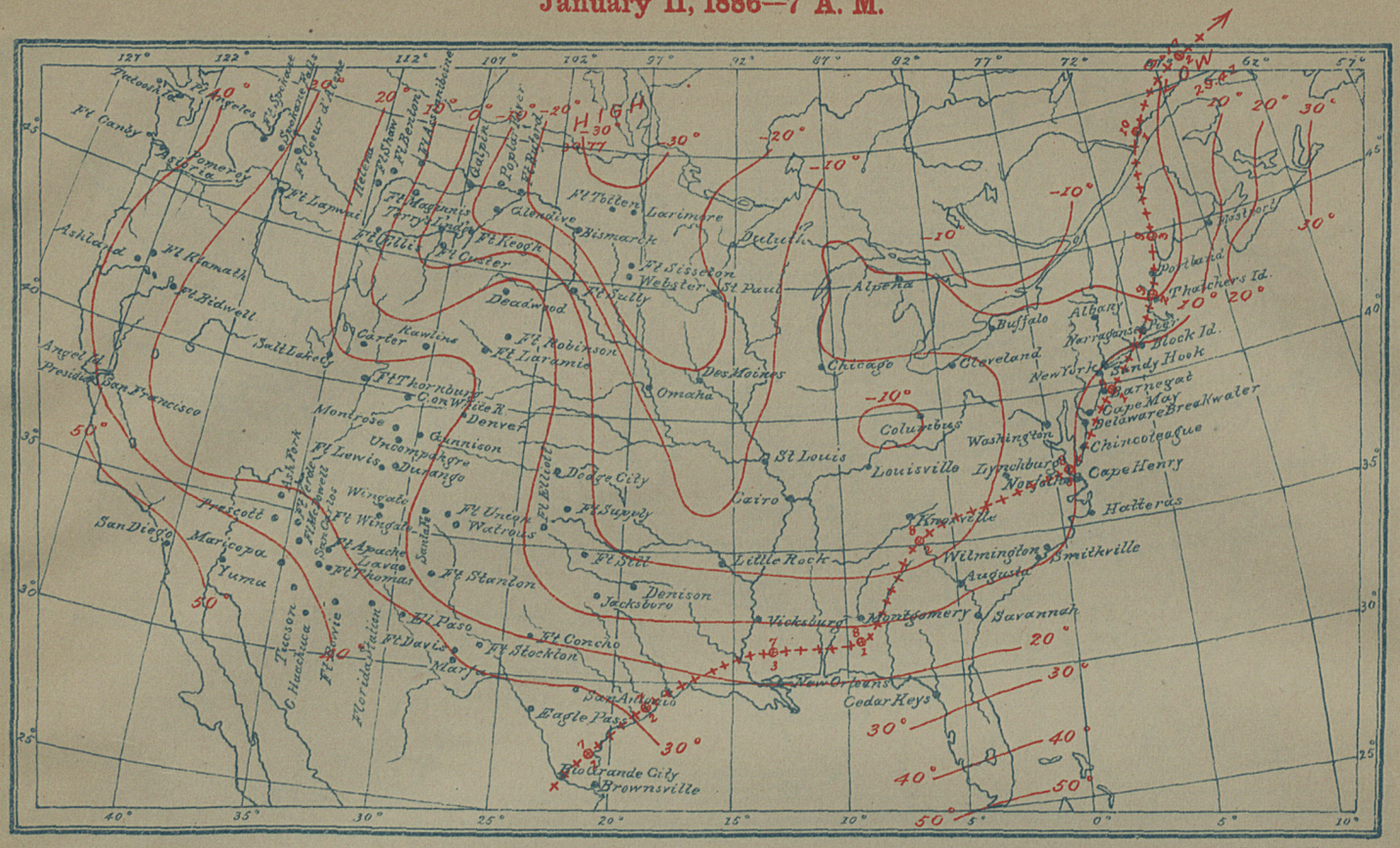
January 9, 1886—7 A. M.



January 10, 1886—7 A. M.

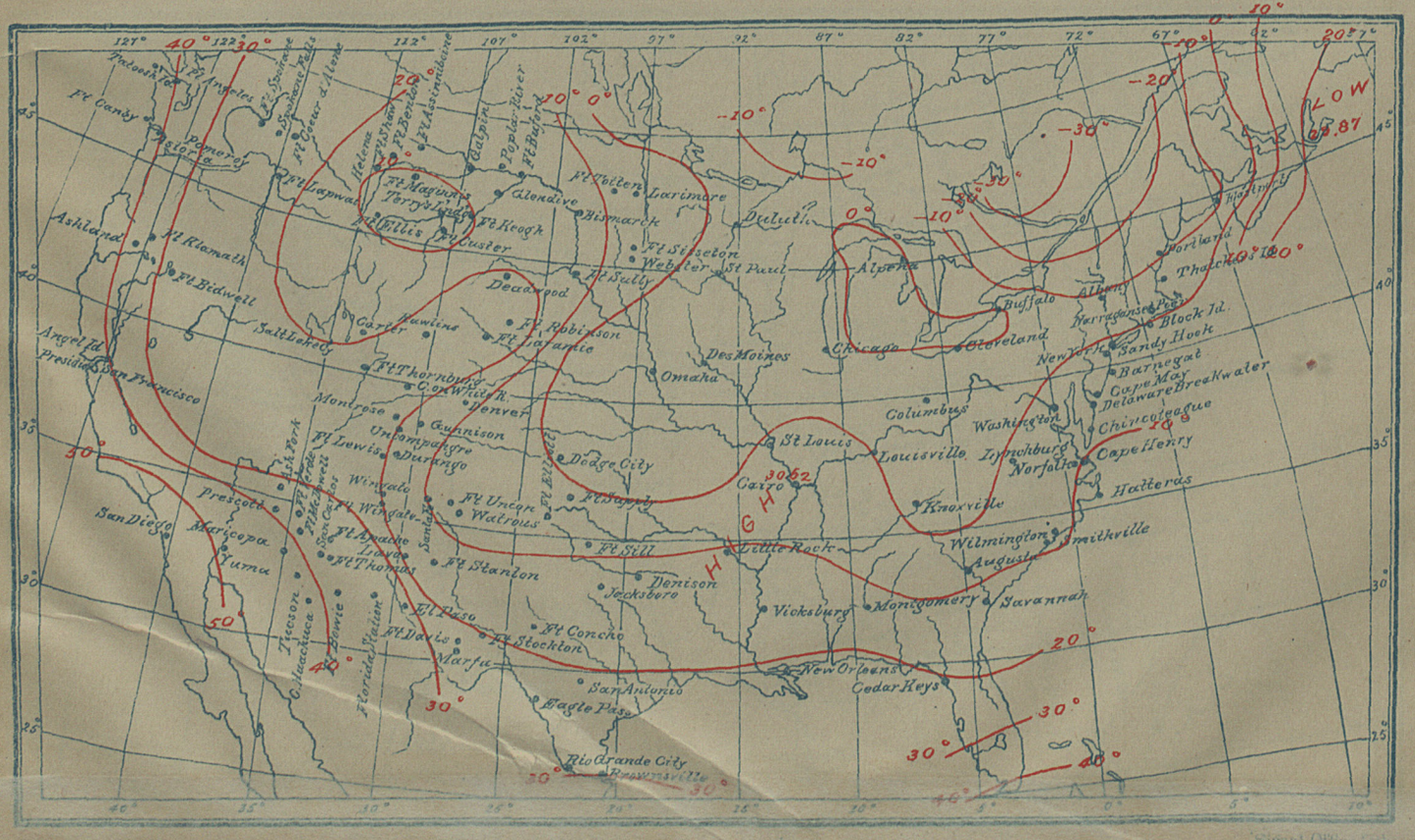


January 11, 1886—7 A. M.



Signal Office Lith.

January 12, 1886—7 A. M.



Signal Office Lith.

4th. This movement northward was retarded while the centre was passing to northern Illinois, and the trough at the south continued, thus leaving the barometer low along the track of the storm. After reaching Lake Michigan the form of the isobars changed, the central depression assuming an oval shape and extending from northeast to southwest; at the same time the storm increased greatly in energy, owing to the advance of the high area to the west. The course changed to easterly, which carried the centre over Lake Huron, but the afternoon chart of the 4th exhibited a secondary depression in the central Mississippi valley. Rain or snow fell in all districts east of the Rocky Mountains on the 4th, the snow extending southward over Tennessee and Arkansas. This storm developed great energy while moving over the Lake regions, the centre passing northeastward from Lake Huron until the morning of the 5th, when a secondary area (which developed in the barometric loop extending over the middle Atlantic states) became the principal centre of disturbance. During the 5th, 6th, and 7th this storm moved slowly northeastward over New England to the Gulf of Saint Lawrence, with increasing severity, the barometer falling at the centre as the storm advanced until it reached 29.17, at Chatham, New Brunswick, on the afternoon of the 7th. Severe gales occurred in the Lake regions, on the New England coast and in the Maritime Provinces. At Father Point, Province of Quebec, the wind reached a velocity of fifty miles per hour on the 7th.

III.—As in the preceding storm, this had its origin in the south of Texas. When the first cyclonic movement of the winds was observed on the west Gulf coast on the 7th, an unusually large area of high pressure covered the country from the lower lake region to the Pacific coast, the barometer being above 30.90 north of Dakota, and the cold wave had extended southward to northern Texas, where the temperature was below zero. This rapid flow of cold air apparently forced this low area to the east, and the increasing energy of the low area as it passed first eastward over the east Gulf states and then northeastward along the coast, apparently forced the cold air to the south and east over the Southern States with great rapidity. These conditions, it will be seen, were such as to favor the transfer of air without the loss of temperature, due to slow movements in the lower latitudes, and the reports as given of the cold wave show the lowest recorded temperatures in many places in the Gulf States and Florida. The barometer continued to fall at the centre of the storm as it moved with great violence northeastward along the Atlantic coast; at Boston, Massachusetts, it fell to 28.73 on the afternoon of the 9th, when the pressure was 30.80 in the extreme northwest. The gradient was steep in all directions; the storm was circular in form, and the lowest isobar about one hundred miles in diameter. The entire coast was warned of the approach of this storm, as were all stations warned of the approach of the cold wave which immediately followed. It passed directly north from Boston, Massachusetts, to Father Point, Province of Quebec, and thence northeast; the pressure remaining below 29.0 until after the 10th. Its maximum energy was developed while passing along the middle Atlantic coast, and as soon as it passed north of New England, the central area enlarged and the winds decreased in force as the cold air from the west passed to the east.

The following extracts from reports of Signal Service observers indicate the severity of this storm:

Fort Macon, North Carolina: a heavy gale occurred on the 8th, the wind reaching a velocity of sixty-two miles per hour from the southwest; the schooner "Cressie Wright" went ashore near Cape Lookout, North Carolina, and was totally wrecked; six of a crew of seven men were lost.

Norfolk, Virginia: the severest gale which has visited this section for years occurred on the 8–9th, causing detention of vessels and great damage on water and land.

Sandy Hook, New Jersey: a violent easterly, backing to northwesterly, gale began at 9 a. m. of the 9th, the barometer falling to 28.72; great damage was done to the track of the New Jersey Southern Railroad by the high water and heavy waves; several casualties to shipping were reported along the coast.

New York City: a heavy northeast gale, with snow, began at 10.40 p. m. of the 8th, and continued throughout the 9th and 10th, the wind reaching a velocity of forty-four miles per hour up to 4.35 a. m. of the 9th, when the anemometer-cups were blown away; numerous disasters to shipping are reported on the adjacent coast.

New London, Connecticut: one of the most severe gales ever experienced at this station, together with a blinding snow storm, began at midnight of the 8th and continued throughout the 9th; numerous disasters to shipping occurred here and in this vicinity.

New Haven, Connecticut: a severe gale occurred on the 9th, the wind reaching a velocity of forty-four miles at 2 a. m. An unknown schooner sank, with all on board, off Charles Island, ten miles from this place.

Point Judith, Rhode Island: a severe gale began at midnight of the 8th and continued throughout the 9th, with great violence; the schooner "Allen Greene" went ashore about a mile from this place, and several vessels passed in a disabled condition.

Newport, Rhode Island: an unusually heavy gale occurred on the 8–9th; great damage was done to the wharves by the high water and heavy waves; the schooner "Mattie D." went ashore at this place and became a total wreck.

Provincetown, Massachusetts: a severe gale occurred on the 9–10th; it is estimated that more damage was done on this part of the coast than at any time within the past ten years.

Boston, Massachusetts: a heavy northeast gale, accompanied by snow, occurred on the 9th, the wind reaching a maximum velocity of sixty-four miles per hour. An immense amount of damage was done by this storm; two vessels were totally wrecked, and seven lives lost in Boston harbor, and it is estimated that forty vessels went ashore on the New England coast.

Eastport, Maine: the storm of the 9th was the most destructive that has passed over this section since the establishment of this station; it was attended by light snow and sleet and a low temperature; nineteen schooners were damaged in the bay, five of which were sunk; the damage sustained by vessels and wharves is estimated at about $20,000.

IV.—This slight depression was at no time within the limits of the United States, and its centre could only be located approximately as it passed eastward far to the north of the Lake region; on the 13th it was central north of Minnesota, and on the afternoon of the 14th it had passed to the longitude of eastern Lake Superior, where it was last observed. It was unattended by any marked change in the weather conditions within the United States or Canada.

V.—When the preceding area was moving eastward north of the Lake region, number v was slowly forming to the south of Texas. The distribution of pressure being as follows: The high area (attending the cold wave), 30.80, was central over Nova Scotia, the barometer being generally above 30.40 east of the Mississippi Valley; a second high area extended over Montana and a low area was off the north Pacific coast. This low area advanced northward, separating the two high areas referred to above, and formed a barometric trough (similar to that mentioned in the description of number ii); the high area to the west increased as this storm moved northward to Lake Superior. The temperature rose in the eastern districts as the barometer fell, and a cold wave followed in the western districts, but the cold was not felt as far to the south nor was it as severe in the northern districts as that which followed low area number iii. This storm was most severe in the upper lake region, where the gradient to the west was greatest, the range of pressure being one inch in the northwest quadrant of this low area. When the centre reached Lake Superior the course changed to easterly, and the rate of movement so increased as to carry the centre over twenty degrees of longitude in twenty-four hours. It had reached the vicinity of Bird Rock, Gulf of Saint Lawrence, by midnight of the 17th, attended by gales at the northeast stations and decreasing pressure at the centre. When last observed, near Sydney, Nova Scotia, the barometer had fallen to 29.30 and below. It apparently passed over the north Atlantic as a severe storm.

VI.—This storm also originated in the Southwest when the barometer was high over the Missouri Valley and northward. It was first located as central in southern Missouri, but the barometer had been below the normal from the lower Mississippi valley westward to the Pacific coast, and a low area had extended over the central plateau regions and California. This western low area cannot be traced to the east of the Rocky Mountains, but it is probable that the existence of this low area favored the development of the disturbance to the east. It moved rapidly to the northeast from southern Missouri to the Saint Lawrence Valley, causing general snows or rain on the 18th and 19th, and was quickly followed by a cold wave

and clearing weather in the central valleys and Lake regions. The centre apparently passed from the upper Saint Lawrence Valley to the New England coast during the night of the 19th and then to the northeast of New England where the barometer fell .6 in eight hours.

VII.—The barometer was unusually low on the north Pacific coast during the afternoon of the 19th, while a high area and cold wave extended over the eastern slope of the Rocky Mountains. This low area moved eastward, and the isobars over the plateau regions indicated that low area number vii originated as a secondary disturbance over the central plateau region. It was first marked as in western Kansas on the morning of the 20th; from this section it advanced east and northeast, attended by general rains or snow. The barometer did not fall below 29.70 within this area, and the gradient was not rapid until it reached the Lake region. The strongest winds occurred when it was central in the lower lake region and immediately before it disappeared in the upper Saint Lawrence valley near Montreal, Province of Quebec.

VIII.—This disturbance originated as a secondary low area, and was first observed in the central Rocky Mountain region on the morning of the 21st. The principal disturbance, from which this and the preceding depression originated, remained west of the Rocky Mountains. The direction of movement was to the southeast during the first eight hours, and during the night of the 21st two low areas were observed, one central in Wisconsin and the other central in Indian Territory; the latter disappeared before the cold wave that followed the easterly movement of the former, which moved slowly over the upper lake region and then rapidly northeastward and disappeared over the Gulf of Saint Lawrence.

IX.—Previous to the appearance of this low area in the Southwest, a slight depression passed eastward from the northern Rocky Mountain region (and probably from the Pacific coast) over the Lake region, but its movements were not clearly defined and the depression was so slight that it has not been traced as a low area. Number ix became well defined as a low area central in southwestern Arkansas on the 26th, when a high area, attended by a cold wave, was central north of Manitoba. The barometer was about .3 above the normal for the month on the eastern slope of the Rocky Mountains, and a decided low area was advancing over the north Pacific. The cold air from the north apparently forced this depression to the eastward and caused it to disappear while central in eastern Tennessee, although succeeding reports indicate that a disturbance formed to the east of the south Atlantic coast immediately afterwards, and that this last-named disturbance followed the course of the Gulf Stream during the 28th and 29th, but the track of the storm could not be definitely given.

X.—This low area originated in the north Pacific and appeared as central near Olympia, Washington Territory, as a severe storm on the night of the 26th. The reports of the 27th and 28th indicate that this low area passed directly eastward, crossing the Rocky Mountains north of Montana, and gradually filling up as it approached the Lake region, where it disappeared without causing any change in the atmospheric condition of the eastern districts.

XI.—This low area was observed far to the north of Montana on the afternoon of the 29th, following the high area which had previously moved southwestward to the plateau regions. This area moved rapidly to the southeast during the 29th and 30th, following the Missouri Valley and crossing to the east of the Mississippi Valley as a well-defined low area, but it disappeared after reaching the Ohio Valley and could not be traced as a distinct depression after midnight of the 30th. The precipitation attending this depression was generally light, and the barometer fell as the depression moved to the southeast, the lowest reading being observed when the centre was near Indianapolis, Indiana. The disappearance of this depression within the limits of the stations of observation was probably due to the low area previously referred to as following the Gulf Stream. This storm was central near the New England coast on the 30th, the barometer being below 29.40, and the outward flow of the upper air currents from this storm may have increased the supply of air over the low area to the west, thus causing it to disappear within the limits of the stations of observation.

NORTH ATLANTIC STORMS DURING JANUARY, 1886.

[*Pressure expressed in inches and millimetres; wind-force by scale of* 0-10.]

The tracks of the areas of low pressure that have appeared over the north Atlantic Ocean are determined, approximately, from international simultaneous observations furnished by captains of ocean steamships and sailing vessels; abstracts of ships' logs and special reports collected by the Signal Service agencies at the ports of New York, Boston, and Philadelphia; reports received through the co-operation of the "New York Herald Weather Service;" abstracts of ships' logs furnished by the proprietors of the "New York Maritime Register," and from other miscellaneous data, received at this office up to February 21, 1886.

The paths of seven areas of low pressure are shown on the chart for January, 1886. Of these, two, viz., numbers 5 and 6, are continuations of low areas which had previously passed over the United States and Canada; one, number 7, developed off the coast of Florida; number 1 appeared over the ocean in N. 46°, W. 40°; and the position of the remaining low areas, numbers 2, 3, and 4, are shown by a portion of their tracks in the northeast Atlantic near the coast of the British Isles.

The weather over the north Atlantic Ocean during January, 1886, was marked by frequent high winds and gales. The pressure over mid-ocean from the beginning of the month up to the 18th was generally high, while successive areas of low pressure took their course along the coasts of the United States and Canada, and also over the northeast Atlantic and the British Isles. From the 19th to the close of the month the pressure over mid-ocean and the European coast was comparatively low. Areas of high pressure occupied the ocean south of the Banks from the 19th to the 22d and from the 25th to the 28th.

The following are descriptions of the low areas charted:

1.—This area of low pressure first became well defined on the 2d, when the centre was near N. 46°, W. 40°, and the pressure, as reported by the s. s. "Schiedam," 29.74 (755.4); it had probably existed as a depression on the preceding day farther to the southward. This area moved eastward, and on the 3d its position is indicated by rains between N. 40° and 49° and W. 25° and 30°.

2.—This area of low pressure originated in high latitudes off the northeast coast of Europe, causing strong nw. gales over the northern portion of the British Isles on the 2d, accompanied by falling barometer. On the 3d the s. s. "Ethiopia," John Wilson, commanding, in N. 54° 40′, W. 19° 00′, reported strong w. to wnw. gales and heavy sea. The s. s. "Stockholm City," K. Doyle, commanding, in N. 58° 45′, W. 4° 00′, had a furious storm from w. and terrific squalls, with high seas, on the 3d, continuing on the 4th, when the barometer fell to 29.15 (740.4). The s. s. "Prinz Leopold," Wm. Rubarth, commanding, experienced a whole gale, setting in from the sw. on the 3d and continuing on the 4th, with falling barometer; in N. 59° 57′, W. 5° 59′, on the 4th, the barometer read 28.85 (732.8). This area moved steadily southward until on the 5th its approximate latitude is indicated on the chart at N. 54° and on the 6th at N. 50°, but without the necessary data from the land stations to determine with reliability the longitude of its path.

3.—This low area appeared off the west coast of Ireland on the 10th, and by the 11th had apparently moved eastward over Great Britain, as indicated by the following reports: The s. s. "Norseman," E. Maddox, commanding, in N. 50° 39′, W. 8° 37′, reported a fresh nw. to nne. gale and heavy squall on the 10th. The s. s. "Geiser," C. W. Möller, commanding, in N. 59° 10′, E. 0° 42′, had fresh gales with force 5 from se. on the 10th, veering to wsw. on the 11th and increasing to a force of 7, while the barometer fell to 28.95 (735.3). The s. s. "Durham